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Accreditation
Program

Thermal Insulation Materials

Lawrence I. Knab

NIST HANDBOOK 150-15

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[1] At Boulder, CO 80303.
[2] Some elements at Boulder, CO 80303.

NIST HANDBOOK 150-15

National Voluntary Laboratory Accreditation Program

Thermal Insulation Materials

Lawrence I. Knab

July 1995

U.S. Department of Commerce
Ronald H. Brown, Secretary

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National Institute of Standards and Technology
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PREFACE

NIST Handbook 150-15 presents the technical requirements of the National Voluntary Laboratory Accreditation Program (NVLAP) for Thermal Insulation Materials (TIM) field of accreditation. It is intended for information and use by staff of accredited laboratories, those laboratories seeking accreditation, other laboratory accreditation systems, users of laboratory services, and others needing information on the requirements for accreditation under the TIM program.

This publication supplements NIST Handbook 150, *NVLAP Procedures and General Requirements*, which contains Part 285 of Title 15 of the U.S. Code of Federal Regulations (CFR) plus all general NVLAP procedures, criteria, and policies. The criteria in NIST Handbook 150 encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987). Handbook 150-15 contains information that is specific to the TIM program and does not duplicate information contained in the Procedures and General Requirements. The numbering of the sections of this handbook is patterned after Handbook 150; for example, Section 285.3 of Handbook 150 presents the description and goal of NVLAP, whereas Section 285.3 of Handbook 150-15 presents the description of the TIM program. Where there is no material specific to the field of accreditation, the section number is omitted.

Any questions or comments on this handbook should be submitted to the National Institute of Standards and Technology/NVLAP, Building 411, Room A162, Gaithersburg, MD 20899; phone (301) 975-4016; fax (301) 926-2884; e-mail NVLAP@enh.nist.gov.

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SUMMARY

Any laboratory (including commercial, manufacturer, university, or federal, state, or local government laboratory) that tests in accordance with the applicable standard test methods may apply for NVLAP accreditation in the Thermal Insulation Materials (TIM) program. Accreditation will be granted to a laboratory that satisfactorily fulfills the conditions for accreditation defined in NIST Handbook 150, *NVLAP Procedures and General Requirements*, which contain Title 15, Part 285 of the Code of Federal Regulations. These conditions include satisfactory performance in selected proficiency testing as required, and fulfilling the on-site assessment requirements, including resolution of identified deficiencies. The names of NVLAP-accredited laboratories are published in the NVLAP annual directory and other media to which information is regularly provided.

Testing services covered: The scope of the TIM program covers standard test methods for thermal insulation materials given in the Test Method Selection List (Appendix D).

Period of accreditation: One year, renewable annually.

On-site assessment: Visit by a technical expert(s) to determine compliance with the NVLAP criteria before initial accreditation and every two years thereafter. Additional monitoring visits as required.

Assessors: Technical experts with experience in testing of thermal insulation materials.

Proficiency Testing: Each laboratory is required to test and analyze proficiency testing sample material(s) for specific test methods. Proficiency testing rounds are conducted semiannually. Advance notice, instructions, and data sheets/report forms are provided before testing is scheduled. The completed test data report is sent to NVLAP or, as directed, to the proficiency testing contractor. A summary of results will be sent to the participants.

Special proficiency testing rounds may be separately scheduled for specific needs (e.g., thermal chambers).

Granting Accreditation: Based upon satisfactory on-site assessment and resolution of deficiencies, proficiency testing, and technical evaluation of applicable laboratory information. A Certificate and Scope of Accreditation are issued.

Fees: Payments are required as listed on the NVLAP fee schedule, including the administrative/technical support fee, on-site assessment fee, proficiency testing fee, and test method fee.

Sec. 285.1 Purpose

The purpose of this handbook is to set out procedures and technical requirements for NVLAP accreditation of laboratories which perform test methods covered by the Thermal Insulation Materials (TIM) program. It complements and supplements the NVLAP programmatic procedures and general requirements found in NIST Handbook 150. The interpretive comments and additional requirements contained in this handbook make the general NVLAP criteria specifically applicable to the TIM program. The quality system requirements are designed to comply with the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002.

Sec. 285.2 Organization of procedures

(a) The procedures described in this handbook are organized to cross-reference with NIST Handbook 150, *NVLAP Procedures and General Requirements*.

(b) In addition, the handbook contains six appendices:

(1) Appendix A provides examples of a Certificate of Accreditation and a Scope of Accreditation for the Thermal Insulation Materials program;

(2) Appendix B provides the General Operations Checklist, which NVLAP assessors use during an on-site technical assessment to evaluate a laboratory's ability to conduct testing in general;

(3) Appendix C provides the Specific Operations Checklist, which NVLAP assessors use during an on-site technical assessment to evaluate a laboratory's ability to conduct specific test methods for determination of properties of thermal insulation materials and evaluate the performance of thermal insulation in selected assemblies;

(4) Appendix D lists the standard test methods and their accompanying NVLAP Codes for the TIM program as given on the NVLAP Test Method Selection List;

(5) Appendix E gives a description of a critical element summary for use by NVLAP assessors for uniformly and objectively conducting on-site technical assessments; and

(6) Appendix F presents the sheets that the assessor completes in conducting test method reviews during on-site assessments.

Sec. 285.3 Description of Thermal Insulation Materials program

The NVLAP program for Thermal Insulation Materials provides for laboratory accreditation to assure that standard test procedures to measure corrosiveness; thermal resistance; strength; flammability; mass, density, and dimensional stability; and water vapor retarder characteristics are followed. The TIM program uses standard test methods, listed in Appendix D, from the American Society for Testing and Materials (ASTM), Code of Federal Regulations (CFR), the Technical Association of the Pulp and Paper Industry (TAPPI), and the Canadian General Standards Board (CGSB).

As an example of standard test methods, ASTM methods include C177 (Guarded Hot Plate), C236 (Guarded Hot Box), and C518 (Heat Flow Meter).

The TIM program was established in 1979 at the request of three private sector thermal insulation trade associations. The purpose of the program is to accredit laboratories that produce reliable thermal insulation test data. The TIM program was the first of the NVLAP laboratory accreditation programs.

Sec. 285.4 References

(a) The following documents are referenced or cited in this handbook:

(1) ISO/IEC Guide 25, *General Requirements for the Competence of Calibration and Testing Laboratories*, and ISO 9002, *Quality Systems—Model for Quality Assurance in Production and Installation*; available from:

American National Standards Institute (ANSI)
11 West 42 Street, 13th Floor
New York, NY 10036

Order Phone: (212) 642-4900
Order Fax: (212) 302-1286;

(2) NIST Handbook 150, *NVLAP Procedures and General Requirements*; available from:

NIST/NVLAP
Building 411, Room A162
Gaithersburg, MD 20899

Phone: (301) 975-4016
Fax: (301) 926-2884.

(b) The most recent publication of the standard(s) for the test method(s) for which the laboratory is accredited shall be available as reference(s). For the TIM program, these standards (Appendix D) and where they can be obtained are:

(1) American Society for Testing and Materials (ASTM)
1916 Race Street
Philadelphia, PA 19103-1187

Phone: (215) 299-5400
Fax: (215) 977-9679.

(2) Code of Federal Regulations (CFR). The 16 CFR Part 1209, "Interim Safety Standard for Cellulose Insulation" is available in the U.S. Code of Federal Regulations.

(3) Technical Association of the Pulp and Paper Industry (TAPPI)
15 Technology Parkway South
Norcross, GA 30092

Phone: (404) 446-1400
Fax: (404) 446-6947.

(4) Canadian General Standards Board (CGSB)
Sales Unit
Ottawa, Canada K1A 1G6

Phone: (613) 941-8703
Fax: (613) 941-8705

Sec. 285.5 Definitions

Conductance, thermal: The time rate of steady state heat flow through a unit area of a material or construction induced by a unit temperature difference between the body surfaces. Thermal conductance and thermal resistance are reciprocals of one another. [ASTM C168-90]

Critical elements: A compilation of summary statements of the key provisions of a standard test method that guides individual assessors in applying a common objective assessment of a laboratory's ability to conduct tests.

Density, apparent (of applied insulation): The mass per unit volume of in-place mass thermal insulation. [ASTM C168-90]

Quality assurance: All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. [ISO 8402:1994]

Quality control: The operational techniques and activities that are used to fulfill requirements for quality. [ISO 8402:1994]

Resistance, thermal, R: Quantity determined by the temperature difference, at steady state, between two defined surfaces of a material or construction that induces a unit heat flow through a unit area. Thermal resistance and thermal conductance are reciprocals of one another. [ASTM C168-90]

Strength, transverse (or flexural): The breaking load applied normal to the neutral axis of the beam. [ASTM C168-90]

Thermal insulation: A material or assembly of materials used to provide resistance to heat flow. [ASTM C168-90]

Water vapor retarder: A material or system that adequately impedes the transmission of water vapor under specified conditions. [ASTM C168-90]

Sec. 285.6 NVLAP documentation

(a) Test Method Selection List

Depending on the breadth of its testing capabilities, a laboratory may seek accreditation to all or only selected methods offered in the TIM program. The Test Method Selection List is provided to the laboratory seeking accreditation as part of the NVLAP application package.

Appendix D provides the Test Method Selection List which contains standard test methods for the TIM program. This list is updated periodically and is available from NVLAP. The test methods in Appendix D are placed in one of six groups as follows:

(1) Corrosiveness;

(2) Mass, Density, and Dimensional Stability;

(3) Flammability;

(4) Strength;

(5) Thermal Resistance;

(6) Related Material Properties; or

(7) Canadian Standards (Specifications).

A laboratory may request to have test methods added which are not listed in Appendix D. Any test method additions will be handled in accordance with NVLAP procedures for adding to or modifying an established LAP (see Handbook 150, Sec. 285.18).

(b) Checklists

Checklists contain definitive statements or questions about all aspects of the NVLAP criteria for accreditation. NVLAP programs incorporate two types of checklists:

(1) The NVLAP General Operations Checklist addresses factors applicable to evaluating a laboratory's ability to conduct testing in accordance with the procedures and general requirements for accreditation. The factors include, but are not limited to, the laboratory's organization, management, and quality system in addition to its testing competency.

The General Operations Checklist, presented in Appendix B, is numbered to correspond to the requirements in NIST Handbook 150. The comment sheets are used by the assessor to explain findings and deficiencies noted on the checklist, as well as to make comments on aspects of the laboratory's performance other than deficiencies.

(2) The Specific Operations Checklist contains statements or questions that are specific to the test methods in the TIM program and focus on the testing requirements for the methods with emphasis on performing the tests, testing accuracy, instrumentation, calibration, personnel competency, and test reporting.

The Specific Operations Checklist is presented in Appendix C, along with comment sheets similar to those used with the General Operations Checklist.

Sec. 285.22 Assessing and evaluating a laboratory

(a) On-Site Assessment

(1) The NVLAP assessor will request manuals and/or documented procedures in advance of the on-site assessment to reduce time at the laboratory. Documents supplied in advance will be returned. The laboratory should be prepared for conducting test demonstrations and have testing equipment in good working order. The assessment will cover the requirements identified in this handbook, NIST Handbook 150, the laboratory's quality manual, and its written test procedures. During the time at the laboratory, the assessor will need work space to complete assessment documentation.

(2) NVLAP technical assessors are provided with "critical elements" in addition to the checklists (described in 285.6, *NVLAP documentation*) to help assure the completeness, objectivity, and uniformity of the on-site assessment. The format of a critical element is presented in Appendix E.

(3) Along with the Specific Operations Checklist, the assessor uses the instructions and comment sheets shown in Appendix F in reviewing the laboratory's ability to perform the test methods. The test method review ranges from observing tests to having laboratory staff describe the test procedures. The assessor notes on the On-Site Assessment - Test Method Review Summary (p. F-4) the depth into which each part of the test method was reviewed.

The test method review is directly connected to the critical elements. Note that the column headings of the Test Method Review Summary are essentially the same as the headings of the critical elements.

(4) An assessor performs the following activities during a typical on-site assessment:

(i) Conducts an entry briefing with the laboratory manager to explain the purpose of the on-site visit and to discuss the schedule for the day(s). At the discretion of the laboratory manager, other staff may attend the briefing.

(ii) Reviews laboratory quality manual and its implementation, and records, including the following:

- sample identification and tracking procedures and copies of completed test reports;

- records of periodic internal audits and use of quality control procedures and participation in interlaboratory comparisons or other similar programs; and

- personnel records, including résumés and job descriptions of key personnel and competency evaluations for all staff members who routinely perform the test method for which accreditation is sought.

At least one laboratory staff member must be available to answer questions; however, the assessor may wish to review the documents alone. The assessor usually does not ask to take any laboratory documents with him/her, and documents previously supplied will be returned.

(iii) Physically examines equipment and facilities and observes the demonstration of selected procedures by appropriate personnel assigned to conduct the tests, and interviews those personnel. The demonstrations requested may be selective or all-inclusive, and must include sample test material(s), preparation of devices, establishment of test conditions and the setup/use of major equipment. The assessor may provide a proficiency test sample and request a specific demonstration.

(iv) Completes an On-Site Assessment Report, which contains the minimum requirements prescribed in NIST Handbook 150, Sec. 285.22(b)(2), as well as the completed checklists. At the exit briefing, a discussion of the assessment is carried out. The first page of the report is signed by the assessor and the laboratory's Authorized Representative to acknowledge the discussion but does not necessarily indicate agreement; appeals may be made through NVLAP. All observations made by the NVLAP assessor are held in the strictest confidence.

(b) Proficiency Testing

(1) NIST Handbook 150 defines (Sec. 285.5) and describes (Sec. 285.22(4)) how proficiency testing is included in the accreditation process. TIM test methods that require proficiency testing are identified by an asterisk (*) in the Test Method Selection List (Appendix D). ***Currently, however, proficiency testing fees are required from all participating laboratories, regardless of which test methods are selected for accreditation.***

Proficiency testing is generally conducted twice a year and may be selectively conducted for thermal chambers. Laboratories renewing accreditation must have satisfactorily participated in all required proficiency testing during their previous accreditation period. Failure to participate is considered a deficiency and may result in suspension of accreditation.

(2) NVLAP conducts the proficiency testing for the TIM program through a proficiency testing contractor.

(3) Twice a year each laboratory is sent, (or is instructed to obtain), selected test samples, data sheets, and instructions for test specimen handling, preparation, conditioning, mounting, and testing. Proficiency testing may consist of several parts in order that the operation of a laboratory might be evaluated. Also, portions of the standard test procedure may be emphasized; e.g., measurement and instrumentation, hardware, and data analysis. Generally, it is required that the specific proficiency test procedure be conducted in accordance with the applicable standard test method. At times, NVLAP may specify special conditions to assure uniformity in procedures and test conditions among participants. Those may include the number of replicate measurements, special conditions of temperature and humidity, and other test parameters. ***The work must not be contracted out to another laboratory.*** Completed test results and data sheets must be returned to NVLAP, or the designated address, by the date specified on the data sheets. Failure to return the data sheets by the deadline may result in penalties which may include suspension of accreditation.

(4) On occasion, the on-site assessor hand carries proficiency test samples to the laboratory. These proficiency test samples, like all others received by the laboratory, are to be listed or entered into the normal sample tracking and identification system for control and data recording. In these cases, at the direction of the assessor, the samples may be returned to the on-site assessor rather than stored at the laboratory. Alternatively, the laboratory may be instructed to send the samples back to the proficiency testing contractor, or to a destination specified by NVLAP or the proficiency testing contractor.

(5) After completion of a given proficiency test round, samples that are not returned to the on-site assessor or proficiency testing contractor become the property of the laboratory for use at its discretion. Experience has shown that these proficiency test samples are often useful to the laboratory as training artifacts, or as calibration-check samples. ***However, in no case shall these proficiency test samples be considered as calibration standards or standard reference materials and be used as substitutes for calibration standards that are traceable to national (i.e., NIST) or international standards laboratories.***

(6) Proficiency test data are analyzed using statistical procedures to determine distributions and parameters, such as averages, standard deviations, and outliers. The results of the proficiency testing are reported to the participants in appropriate documents and reports. The identity and performance of individual laboratories remain confidential. Test data from proficiency testing must be used in monitoring the laboratory's own test performance.

After notification of unsatisfactory performance, the laboratory must take corrective action to resolve the deficiency in a timely manner, similar to the process for on-site assessment deficiency resolution. Failures may result in revocation or suspension of accreditation.

The results of proficiency testing are also made available to on-site assessors for use during laboratory assessment visits. If problems are indicated by proficiency testing, they are discussed with appropriate laboratory personnel responsible for developing and implementing plans for resolving the problems.

Sec. 285.23 Granting and renewing accreditation

Laboratories granted NVLAP accreditation are provided with two documents: a Certificate of Accreditation and a Scope of Accreditation. Samples of these accreditation documents for the TIM program are shown in Appendix A. Note that the certificate states that the criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987).

Sec. 285.33 Criteria for accreditation

(c) Quality system, audit and review

(1) Under its quality system, the laboratory shall implement policies and operational procedures covering all the technical requirements of this handbook. Periodic reviews of the quality system shall reflect adherence to NVLAP requirements and the laboratory's quality objectives. These reviews should reflect positive aspects of the quality system as well as deficiencies.

Examples of operational procedures that must be included in the quality manual are:

(i) procedures for receipt, identification, and tracking of test samples;

(ii) procedures by which the laboratory describes the thermal insulation materials test samples and the criteria for their acceptance or rejection;

(iii) procedures for interlaboratory comparison and the laboratory's participation in proficiency testing, a summary of the results, and a description of any corrective actions taken because of the results; and

(iv) the personnel training and competency evaluations which demonstrate that the test procedures are being followed correctly.

(2) NIST Handbook 150, Sec. 285.33(c)(2) lists quality system requirements that must be included in the quality manual. In addition, the quality manual must contain or make reference to the location of procedures or testing manuals containing detailed descriptions of the procedures, practices, and equipment that the

laboratory uses in conducting the test methods for which it seeks accreditation.

(3) During the on-site assessment, supporting documentation is to be made readily accessible to the NVLAP assessor. The assessor reviews the laboratory's own detailed procedures to perform tests of thermal insulation materials according to the standardized test procedures for which it seeks accreditation, the range of specimens it can test, and the descriptions of the maintenance and calibration of its specific equipment. Such descriptions may be prepared in a form convenient to the particular needs of the laboratory, but all the elements required by NVLAP procedures must be covered. The documentation must be readily accessible to the staff.

(4) The quality manual shall contain a description of the procedures that the laboratory uses to evaluate the uncertainty of its measurements using within-laboratory or replicate testing.

(5) The most recent publication of the standards for the test methods for which the laboratory is accredited shall be available as references and are to be followed in conducting the test procedures. The test methods that may be selected by the laboratory are listed in the Test Method Selection List (Appendix D).

(d) Personnel

(1) The laboratory shall maintain records on each staff member, including a résumé of qualifications; laboratory testing procedures to which the person is assigned; and the results of periodic testing performance reviews, which may include intra-operator tests and between-laboratory tests.

[NOTE: For the purpose of on-site assessments, a separate personnel folder of information specific to applicable NVLAP requirements may be provided instead of the complete folder which may contain confidential information not needed for the assessment.]

(2) The laboratory shall have a description of its training program for ensuring that staff are able to perform tests properly.

(3) The laboratory shall ensure that each new staff member is trained for the testing duties assigned and that staff members are retrained when they are assigned new responsibilities or when test methods are updated.

(4) The laboratory shall evaluate the competency of each staff member for each test method the staff member is authorized to conduct. An evaluation and observation of performance shall be conducted annually by the immediate supervisor, or a designee appointed by the laboratory director, and must be adequately documented. A record of the annual evaluation of each staff member must be dated and signed by the supervisor and the employee, and retained in the personnel file.

The following examples list competency review items:

(i) general requirements of the test methods;

(ii) specimen preparation, dimensional measurements, mounting techniques;

(iii) use and maintenance of environmental control apparatus, including humidity cabinets;

(iv) environmental conditioning of specimens;

(v) calibration of test machines;

(vi) determination of moisture content and specific gravity;

(vii) calibration and reading of load/deformation/strain recording equipment;

(viii) operation of fire performance test equipment;

(ix) thermocouple mounting, calibration, and related instrumentation;

(x) drying ovens and furnaces;

(xi) description of specimen and test setup;

(xii) balances and scales for mass determination;

(xiii) dimensional measuring devices (calipers, micrometers, etc.);

(xiv) heat flux meters and pyrometers;

(xv) automatic data logging and readout instrumentation;

(xvi) ammeters, ohmmeters, voltmeters, wattmeters, potentiometers;

(xvii) radiant panel;

(xviii) heat flow meters;

(xix) guarded hot plates; and

(xx) calculation of thermal parameters (transmittance, conductance, conductivity, resistance, etc.).

(5) Reference documents, texts, and current scientific and industry periodicals shall be made available to all technical staff to keep their knowledge up to date.

(f) Equipment and reference materials

All facilities and equipment used for performing the applicable tests must conform with the requirements of the standard test methods. For departures from standard test methods and test equipment, the laboratory must provide sufficient data to show equivalency to that specified in the standard.

The laboratory workspace and any environmentally controlled spaces (e.g., constant temperature-relative humidity rooms or cabinets) are to be checked for proper conditions, including monitoring devices. Monitoring devices need to be checked that they are calibrated and functioning properly to maintain the required environmental conditions.

The equipment used for conducting the tests in the TIM program shall be maintained and calibrated (or verified) in accordance with the manufacturer's recommendation, as specified in the test method, or as specified below, whichever results in shorter time periods between calibrations:

Apparatus/Instrumentation	*Frequency*
dimensional measuring devices (calipers, micrometers, etc.)	annually
drying ovens	annually
furnaces	annually
tensile/compression test machines and load cells	annually
scales and balances	annually
heat flux meters	annually
pyrometers	annually
automatic data logging and readout*	annually
potentiometers*	annually
ammeters, ohmmeters, voltmeters, and wattmeters*	annually
thermocouple and related instrumentation*	annually
thermostats*	annually
environmental conditioning units	quarterly
humidity cabinets	quarterly
radiant panel	per test method
heat flow meters**	per test method
guarded hot plates	per test method

* If the calibration of the equipment is shown to vary due to lack of modern solid-state electronics, then the entry under "Frequency" shall be 6 months.

** If certification of measurement is required using ASTM C518 (NVLAP Test Method Code 01/T06), the calibration procedures and frequencies given in Section 5.4.1 of that test method must be followed.

(g) Measurement traceability and calibration

(1) The laboratory's calibrations may be performed by properly trained staff using calibrated standards, or through contract(s) with a competent external calibration service. All calibrations and characterizations must be done against reference standards that are traceable to national standards maintained by NIST or by a foreign national standards authority that issues reference or calibration materials. It is the responsibility of the laboratory seeking accreditation to determine that, where appropriate, calibration services use reference standards traceable to NIST or a foreign national standards authority. The use of a NVLAP-accredited calibration laboratory fulfills the foregoing traceability requirement.

(2) Calibration certificates and records and evidence of the traceability of the reference standards used must be retained and made available for an assessor's inspection during the on-site visit. The calibration certificate should indicate uncertainty or accuracy tolerance limits, and traceability of reference standards. If calibration is performed by the laboratory, the standard metrological procedures used, the environmental conditions, and the measurement uncertainty must be documented. Certificates are required for calibration performed by outside services; they are not required for all testing equipment.

The records for each calibration and test shall contain sufficient information to permit their repetition. The records shall include the identity of personnel involved in sampling, preparation, calibration or testing.

(3) In addition to the information specified in NIST Handbook 150, Sec. 285.33(f)(4), testing equipment or verification records shall include the following:

(i) notation of all equipment variables requiring verification;

(ii) the range of verification;

(iii) the resolution of the instrument and its allowable error;

(iv) identity of the laboratory individual or external service responsible for calibration; and

(v) source of reference standard and traceability.

(h) Calibration and test methods

(1) Laboratories must use the test procedures described in the standards given in the Test Method Selection List (Appendix D). In order to maintain the quality of the results of these standard tests, a laboratory must have written procedures for the laboratory personnel to follow when conducting the tests. These procedures should address any information not specifically contained in the standard method and any deviations used by the laboratory. These procedures should also include equipment operation, calibration checks, and quality control checks. The NVLAP assessor will evaluate the written procedures and determine their acceptability. The laboratory may use standard test methods in place of developing their own written procedures when the standard test method, at the discretion of the NVLAP assessor, provides sufficient detailed information to conduct the test.

(2) Departures from the standard test procedures are permissible only for conditions based upon technical equivalence and must be acceptable to the client. On-site assessors may only recommend acceptance of the departures to NVLAP; they are not authorized to grant approval to the laboratories.

Departures from those procedures must be identified in detail in test reports as either:

(i) due to client request or client submittal of a nonstandard sample (e.g., size too small), or

(ii) application of a selective mode of testing that deviates from the standard requirements for sound, technically-based reasons (e.g., improvement of accuracy or precision).

If departures arise for laboratory-based reasons (see preceding sentence), data must be available to show that these departures are equivalent to or improve the accuracy and/or precision of the measurement without compromising a given test.

(j) Records

(1) Records may be kept in hard copy or computer form (with an adequate back-up system) and shall be readily accessible and secure. Entries in laboratory notebooks shall be dated and signed or initialed. Computer-based records must contain entries of pertinent staff/date information for data as required in the quality manual and the means to preserve integrity for maintenance of records, without later modifications, as an established safeguard. Records will be reviewed during the on-site assessment by selected sampling.

(2) The records to be maintained include:

(i) acceptance/rejection of samples of thermal insulation materials submitted for test;

(ii) comprehensive logs for tracking samples and test activities;

(iii) original data collected by the laboratory;

(iv) calibration and verification data;

(v) data and results of quality control;

(vi) equipment and maintenance records; and

(vii) test reports.

(3) Test records, sufficient to reconstruct test reports, shall be kept for a period of 3 years following the completion of testing, unless a longer period is required by the client, regulation, or the laboratory's own procedures.

(k) Certificates and reports

(1) All test reports must contain sufficient information for the exact test conditions to be reproduced at a later time if a retest is necessary. Reports intended for use only by the vendor may conform to vendor/laboratory contract obligations, but must be in accord with NVLAP requirements.

(2) In many cases, raw data collected by computer are collated, reduced, and analyzed for incorporation in the test report. The electronic transmission of the data and development of the test report is generally performed at the laboratory. However, at times, the report may be written at an adjunct facility that is located some distance from the testing laboratory. In such a case, the laboratory must have in place, procedures and documentation for assuring the quality and validity of the data transmission, and their incorporation in the test report.

If organizations use several departments for different testing functions, data collection, and data processing, it is necessary that lines of authority be defined and that no conflict exists. The assessor will review these procedures and documentation during the on-site assessment, and also assure that all NVLAP procedures regarding the writing and storage of reports are followed. Depending upon the assessor's evaluations of the procedures, descriptions and other documentation for assuring the validity of the data transmission and subsequent report writing, an assessment visit to the adjunct facility may be required. When warranted, the assessor will visit the adjunct facility at additional cost to the laboratory before accreditation is granted or renewed.

(m) Outside support services and supplies

The laboratory must verify or test incoming materials and supplies that affect the quality and accuracy of the test results. Examples include equipment vendors, general laboratory equipment, data processing and acquisition equipment, thermocouples, and thermocouple wire.

APPENDIX A

SAMPLE ACCREDITATION DOCUMENTS

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO/IEC GUIDE 58:1993
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

LABORATORY NAME
ANYTOWN, USA

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

THERMAL INSULATION MATERIALS

January 1, 19--
Effective until

For the National Institute of Standards and Technology

NVLAP-01C (4-95)

NVLAP LAB CODE: 0000

National Institute of Standards and Technology

NVLAP®

National Voluntary Laboratory Accreditation Program

ISO/IEC GUIDE 25:1990
ISO/IEC GUIDE 58:1993
ISO 9002:1994

Scope of Accreditation

THERMAL INSULATION MATERIALS **NVLAP LAB CODE 0000**

LABORATORY NAME
Anytown, USA 00000-0000
John Doe Phone: 000-000-0000

NVLAP Code	*Designation*	*Short Title*
CORROSIVENESS		
01/C01	ASTM C739 (Sec. 9)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Corrosiveness)
DIMENSIONAL STABILITY		
01/D27	ASTM C739 (Sec.8)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Density)
FLAMMABILITY		
01/F09	ASTM C739 (Sec. 10)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Critical Radiant Flux)
THERMAL RESISTANCE		
01/T01	ASTM C177	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
01/T04	ASTM C236	Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
01/T05	ASTM C335	Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
01/T06	ASTM C518	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
01/T11	ASTM C976	Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box

January 1, 19--

Effective until

For the National Institute of Standards and Technology

NVLAP-01S (4-95)

APPENDIX B

GENERAL OPERATIONS CHECKLIST

NVLAP LAB CODE: _____

GENERAL OPERATIONS CHECKLIST

Instructions to the Assessor: This checklist addresses general accreditation criteria prescribed in applicable sections of NIST Handbook 150, *NVLAP Procedures and General Requirements*.

This checklist follows and is numbered to correspond to the *NVLAP Procedures and General Requirements*, Subsection 285.33. The numbers in square brackets identify related checklist items. A small black triangle appears in the left-hand margin of selected lines of text throughout this checklist; the marked text applies only to the Calibration Laboratory Accreditation Program (LAP).

Place an "X" beside each checklist item which represents a deficiency. Place a "C" beside each item on which you are commenting for other reasons. Record the item number and your written deficiency explanations and/or comments in this list or on the attached comment sheets. Place a check beside all other items you observed or verified at the laboratory.

SEC. 285.33 CRITERIA FOR ACCREDITATION

(b) ***Organization and management***

(1) The laboratory shall be:

_____ (i) legally identifiable;

Legal name of laboratory ownership: _____

(ii) organized and shall operate in such a way that its permanent, temporary and mobile facilities meet the NVLAP requirements [see also (b)(2)(i), (c)(2)(ii)];

_____ (iii) properly identified on the NVLAP Application.

(2) The laboratory shall:

_____ (i) have managerial staff with the authority and resources needed to discharge their duties [see also (b)(1)(ii), (c)(2)(ii)];

_____ (ii) have policies to ensure that its personnel are free from any commercial, financial and other pressures which might adversely affect the quality of their work;

_____ (iii) be organized in such a way that confidence in its independence of judgment and integrity is maintained at all times;

_____ (iv) specify and document the responsibility, authority and interrelation of all personnel who manage, perform or verify work affecting the quality of calibrations and tests;

_____ (v) provide supervision by persons familiar with the calibration or test methods and procedures, the objective of the calibration or test, and the assessment of the results. The ratio of supervisory to non-supervisory personnel shall be such as to ensure adequate supervision;

_____ (vi) have a technical manager (however named) who has overall responsibility for the technical operations;

Name of person: _____

_____ (vii) have a quality manager (however named) who has responsibility for the quality system and its implementation. The quality manager shall have direct access to the highest level of management at which decisions are taken on laboratory policy or resources, and to the technical manager. In some laboratories, the quality manager may also be the technical manager or deputy technical manager;

Name of person: _____

_____ (viii) nominate deputy(ies) in case of absence of the technical or quality manager;

Name(s): _____

_____ (ix) have documented policy and procedures to ensure the protection of clients' confidential information and proprietary rights [see also (c)(2)(xviii)];

_____ (x) where appropriate, participate in interlaboratory comparisons and proficiency testing programs [see also (c)(2)(xiv), (c)(6)(ii), (g)(3)];

_____ (xi) have documented policy and procedures to ensure that its clients are served with impartiality and integrity.

(c) ***Quality system, audit and review***

(1) The laboratory shall:

_____ (i) have an established and maintained quality system appropriate to the type, range and volume of calibration and testing activities it undertakes;

_____ (ii) have the elements of the quality system documented;

_____ (iii) ensure that the quality documentation is available for use by the laboratory personnel;

_____ (iv) define and document its policies and objectives for, and its commitment to, good laboratory practice and quality of calibration or testing services;

_____ (v) have the laboratory management which ensures that these policies and objectives are documented in a quality manual and communicated to, understood, and implemented by all laboratory personnel concerned;

_____ (vi) ensure that the quality manual is maintained current under the responsibility of the quality manager [see also (c)(2)(iv)].

Date of quality manual: _____

Date of latest update: _____

(2) The quality manual, and related quality documentation, shall state the laboratory's policies and operational procedures established in order to meet the NVLAP requirements. The quality manual and related quality documentation shall contain:

_____ (i) a quality policy statement, including objectives and commitments, by top management;

_____ (ii) the organization and management structure of the laboratory, its place in any parent organization and relevant organizational charts;

_____ (iii) the relations between management, technical operations, support services and the quality system;

_____ (iv) procedures for control and maintenance of documentation [see also (c)(1)(vi), (j)(1)];

_____ (v) job descriptions of key staff and reference to the job descriptions of other staff;

_____ (vi) identification of the laboratory's approved signatories (list here or in the comments section): _____

_____

_____ (vii) the laboratory's procedures for achieving traceability of measurements;

_____ (viii) the laboratory's scope of calibrations and/or tests;

_____ (ix) written procedures for ensuring that the laboratory reviews all new work to ensure that it has the appropriate facilities and resources before commencing such work;

_____ (x) reference to the calibration, verification and/or test procedures used;

_____ (xi) procedures for handling calibration and test items;

_____ (xii) reference to the major equipment and reference measurement standards used;

_____ (xiii) reference to procedures for calibration, verification and maintenance of equipment;

_____ (xiv) reference to verification practices including interlaboratory comparisons, proficiency testing programs, use of reference materials and internal quality control schemes [see also (b)(2)(x), (c)(6)(ii), (g)(3)];

(xv) procedures to be followed for feedback and corrective action whenever:

_____ a) testing discrepancies are detected, or

_____ b) departures from documented policies and procedures occur;

_____ (xvi) the laboratory management policies for departures from documented policies and procedures or from standard specifications;

_____ (xvii) procedures for dealing with complaints [see also (n)];

_____ (xviii) procedures for protecting confidentiality and proprietary rights [see also (b)(2)(ix)];

_____ (xix) procedures for audit and review;

_____ (xx) a description of the laboratory's policy regarding the use of the NVLAP logo;

► _____ (xxi) a statement of the laboratory's policy for establishing and changing
► calibration intervals for equipment it controls; and

_____ (xxii) a statement of the laboratory's policy concerning the technique(s) to be used for determining measurement uncertainty and calibration/verification adequacy.

_____ (3) The laboratory shall arrange for audits of its activities at appropriate intervals to verify that its operations continue to comply with the requirements of the quality system. Such audits shall be carried out by trained and qualified staff who are, wherever possible, independent of the activity to be audited. Where the audit findings cast doubt on the correctness or validity of the laboratory's calibration or test results, the laboratory shall take immediate corrective action and shall immediately notify, in writing, any client whose work may have been affected.

The audits shall be objective and be conducted internally or on contract. The audits shall include both general criteria (documents, records and policies) and technical compliance (test methods and practices and calibration procedures).

_____ (4) The quality system adopted to satisfy the NVLAP requirements shall be reviewed at least once a year by the management to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements.

_____ (5) All audit and review findings and any corrective actions that arise from them shall be documented. The person responsible for quality shall ensure that these actions are discharged within the agreed timescale.

(6) In addition to periodic audits the laboratory shall ensure the quality of results provided to clients by implementing checks. These checks shall be reviewed and shall include, as appropriate, but not be limited to:

_____ (i) internal quality control plans, such as control charts and other available statistical techniques;

NOTE: Measurement assurance techniques are acceptable means to control the measurement process and consistently produce the highest quality measurements.

_____ (ii) participation in proficiency testing or other interlaboratory comparisons [see also (b)(2)(x), (c)(2)(xiv), (g)(3)];

_____ (iii) regular use of certified reference materials and/or in-house quality control using secondary reference materials;

_____ (iv) replicate testings using the same or different methods;

_____ (v) retesting of retained items;

_____ (vi) correlation of results for different characteristics of an item.

(d) ***Personnel*** [see also (c)(2)(v)]

_____ (1) The testing laboratory shall have sufficient personnel, having the necessary education, training, technical knowledge and experience for their assigned functions.

_____ (2) The testing laboratory shall ensure that the training of its personnel is kept up-to-date.

_____ (3) Records on the relevant qualifications, training, skills and experience of the technical personnel shall be maintained by the laboratory.

(e) ***Accommodation (facilities) and environment*** [see also (i)(3)]

_____ (1) Laboratory accommodation, calibration and test areas, energy sources, lighting, heating and ventilation shall be such as to facilitate proper performance of calibrations or tests.

NOTE: Laboratory design will be, to the maximum extent practical, in accordance with the guidelines found in the NCSL Recommended Practice #7, *Laboratory Design*, July 25, 1993.

_____ (2) The environment in which these activities are undertaken shall not invalidate the results or adversely affect the required accuracy of measurement. Particular care shall be taken when such activities are undertaken at sites other than the permanent laboratory premises.

NOTE: It is expected that environments which do not meet generally accepted norms, such as those found in NCSL Recommended Practice #7, yet which exhibit the stability required to apply necessary correction factors, will be specified by the laboratory for the purpose of assessment of compliance with its own procedures to achieve its stated uncertainties.

_____ (3) The laboratory shall provide facilities for the effective monitoring, control and recording of environmental conditions as appropriate. Due attention shall be paid, for example, to biological sterility, dust, electromagnetic interference, humidity, voltage, temperature, and sound and vibration levels, as appropriate to the calibrations or tests concerned.

_____ (4) There shall be effective separation between neighboring areas when the activities therein are incompatible.

_____ (5) Access to and use of all areas affecting the quality of these activities shall be defined and controlled.

_____ (6) Adequate measures shall be taken to ensure good housekeeping in the laboratory.

NOTE: While it is the laboratory's responsibility to comply with relevant health and safety requirements, this is outside the scope of this assessment.

(f) ***Equipment and reference materials***

(1) The laboratory shall:

_____ (i) be furnished with all items of equipment (including hardware, software, and reference materials) required for the correct performance of calibrations and tests;

_____ (ii) in those cases where the laboratory needs to use equipment outside its permanent control, including rented, leased and client-owned equipment, ensure that the relevant NVLAP requirements are met.

_____ (2) All equipment shall be properly maintained. Maintenance procedures shall be documented. Any item of the equipment which has been subjected to overloading or mishandling, or which gives suspect results, or has been shown by verification or otherwise to be defective, shall be taken out of service, clearly identified and wherever possible stored at a specified place until it has been repaired and shown by calibration, verification or test to perform satisfactorily. The laboratory shall examine the effect of this defect on previous calibrations or tests.

_____ (3) Each item of equipment including reference materials shall, when appropriate, be labelled, marked or otherwise identified to indicate its calibration status.

_____ (4) Records shall be maintained of each item of equipment and all reference materials significant to the calibrations or tests performed. The records shall include:

_____ (i) the name of the item of equipment, software or reference material;

_____ (ii) the manufacturer's name, type identification, and serial number or other unique identification;

_____ (iii) date received and date placed in service;

NOTE: For initial accreditation, the date received and the date placed in service are not considered mandatory requirements for inclusion in laboratory records, although this is encouraged as good laboratory practice.

_____ (iv) current location, where appropriate;

_____ (v) condition when received (e.g., new, used, reconditioned);

_____ (vi) copy of the manufacturer's instructions, where available;

_____ (vii) dates and results of calibrations and/or verifications and date of next calibration and/or verification;

_____ (viii) details of maintenance carried out to date and planned for the future;

_____ (ix) history of any damage, malfunction, modification or repair;

▸ _____ (x) measured value observed for each parameter found to be out of tolerance
▸ during calibration/verification.

(g) ***Measurement traceability and calibration***

_____ (1) All measuring and testing equipment having an effect on the accuracy or validity of calibrations or tests shall be calibrated and/or verified before being put into service. The laboratory shall have an established program for the calibration and verification of its measuring and test equipment. The program will ensure the recall or removal from service of any standard or equipment which has exceeded its calibration interval or is otherwise judged to be unreliable.

_____ (2) The overall program of calibration and/or verification and validation of equipment shall be designed and operated so as to ensure that, wherever applicable, measurements made by the laboratory are traceable to national standards of measurement where available. Calibration certificates shall, wherever applicable, indicate the traceability to national standards of measurement and shall provide the measurement results and associated uncertainty of measurement and/or a statement of compliance with an identified metrological specification.

NOTE: Traceability to national standards includes traceability to standards maintained or defined at national laboratories in foreign countries where applicable. In these cases, traceability is achieved via international standards. This includes intrinsic standards of measurement where available.

Where applicable, the methodology of the *Guide to the expression of uncertainty in measurement*: 1993, shall be used as the basis for expression of uncertainty of the measurement. NIST Technical Note 1297; January 1993, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, is a practical application document written around the *Guide to the expression of uncertainty in measurement*. Where detailed procedures are not used to quantify and combine uncertainties (i.e., use of test accuracy ratio concepts), the sources of uncertainty shall be tabulated and demonstrated to be acceptable for the measurement undertaken.

NOTE: A significant number of intrinsic standards, such as the Josephson Array Voltage Standard and the Iodine-Stabilized Helium-Neon Laser Length Standard, have been developed and are now being used by many national standards laboratories and some industrial laboratories. These standards are based on well-characterized laws of physics, fundamental constants of nature, or invariant properties of materials, and make ideal stable, precise, and accurate measurement standards if properly designed, characterized, operated, monitored and maintained. Where intrinsic standards are used, the laboratory should demonstrate by measurement assurance techniques, interlaboratory comparisons, or other suitable means, that its intrinsic standard measurement results are correlated with those of national or international standards.

_____ (3) Where traceability to national standards of measurement is not applicable, the laboratory shall provide satisfactory evidence of correlation of results, for example by participation in a suitable program of interlaboratory comparisons or proficiency testing [see also (b)(2)(x), (c)(2)(xiv), (c)(6)(ii)].

NOTE: Traceability requirements may also be satisfied by:

(i) internationally accepted standards in the field concerned;

(ii) suitable reference materials;

(iii) ratio or reciprocity measurements; or

(iv) mutual consent standards which are clearly specified and mutually agreed upon by all parties concerned.

_____ (4) Reference standards of measurement held by the laboratory shall be used for calibration only and for no other purpose, unless it can be demonstrated that their performance as reference standards has not been invalidated.

_____ (5) Reference standards of measurement shall be calibrated by a body that can provide traceability to a national standard of measurement. There shall be a program of calibration and verification for reference standards.

_____ (6) Where relevant, reference standards and measuring and testing equipment shall be subjected to in-service checks between calibrations and verifications.

_____ (7) Reference materials shall, where possible, be traceable to national or international standards of measurement, or to national or international standard reference materials.

(h) ***Calibration and test methods***

_____ (1) The laboratory shall have documented instructions on the use and operation of all relevant equipment, on the handling and preparation of items and for calibration and/or testing, where the absence of such instructions could jeopardize the calibrations or tests. All instructions, standards, manuals and reference data relevant to the work of the laboratory shall be maintained up-to-date and be readily available to the staff.

_____ (2) The laboratory shall use appropriate methods and procedures for all calibrations and tests and related activities within its responsibility (including sampling, handling, transport and storage, preparation of items, estimation of uncertainty of measurement and analysis of calibration and/or test data). They shall be consistent with the accuracy required, and with any standard specifications relevant to the calibrations or tests concerned.

NOTES:

(i) Calibration procedures shall contain the required range and tolerance or uncertainty of each item or unit parameter being calibrated or verified. In addition, the procedures shall contain the generic description of the measurement standards and equipment needed with the required parameter, range, tolerances or uncertainties, and specifications for performing the measurement of the calibration or verification, and/or representative types (manufacturer, model, option) that are capable of meeting the generic description for the measurement standards. The procedures shall be consistent with the accuracy required, and with any standard specifications relevant to the calibrations/verifications concerned.

(ii) The laboratory shall ensure that the calibration uncertainties are sufficiently small so that the adequacy of the measurement is not affected. Well-defined and documented measurement assurance techniques or uncertainty analyses may be used to verify the adequacy of a measurement process. If such techniques are not used, then the collective uncertainty of the measurement standards shall not exceed 25% of the acceptable tolerance (e.g., manufacturer's specification) for each characteristic of the measuring and test equipment being calibrated or verified.

_____ (3) Where methods are not specified, the laboratory shall, wherever possible, select methods that have been published in international or national standards, those published by reputable technical organizations or in relevant scientific texts or journals.

_____ (4) Where it is necessary to employ methods that have not been established as standard, these shall be subject to agreement with the client, be fully documented and validated, and be available to the client and other recipients of the relevant reports [see also (k)(2)(x)].

_____ (5) Where sampling is carried out as part of the test method, the laboratory shall use documented procedures and appropriate statistical techniques to select samples [see also (k)(2)(ix)].

_____ (6) Calculations and data transfers shall be subject to appropriate checks.

(7) Where computers or automated equipment are used for the capture, processing, manipulation, recording, reporting, storage or retrieval of calibration or test data, the laboratory shall have written procedures which ensure that:

_____ (i) the NVLAP requirements are complied with;

_____ (ii) computer software, computers or automated equipment is documented and adequate for use;

_____ (iii) procedures are established and implemented for protecting the integrity of data; such procedures shall include, but not be limited to, integrity of data entry or capture, data storage, data transmission and data processing;

_____ (iv) computer and automated equipment is maintained to ensure proper functioning and provided with the environmental and operating conditions necessary to maintain the integrity of calibration and test data [see also (f)(1)];

_____ (v) it establishes and implements appropriate procedures for the maintenance of security of data including the prevention of unauthorized access to, and the unauthorized amendment of, computer records.

_____ (8) Documented procedures shall exist for the purchase, reception and storage of consumable materials used for the technical operations of the laboratory [see also (m)(2)].

(i) ***Handling of calibration and test items***

_____ (1) The laboratory shall have a documented system for uniquely identifying the items to be calibrated or tested, to ensure that there can be no confusion regarding the identity of such items at any time [see also (k)(2)(v)].

_____ (2) Upon receipt, the condition of the calibration or test item, including any abnormalities or departures from standard condition as prescribed in the relevant calibration or test method, shall be recorded. Where there is any doubt as to the item's suitability for calibration or test, where the item does not conform to the description provided, or where the calibration or test required is not fully specified, the laboratory shall consult the client for further instruction before proceeding. The laboratory shall establish whether the item has received all necessary preparation, or whether the client requires preparation to be undertaken or arranged by the laboratory.

_____ (3) The laboratory shall have documented procedures and appropriate facilities to avoid deterioration or damage to the calibration or test item, during storage, handling, preparation, and calibration or test; any relevant instructions provided with the item shall be followed. Where items have to be stored or conditioned under specific environmental conditions, these conditions shall be maintained, monitored and recorded where necessary. Where a calibration or test item or portion of an item is to be held secure (for example, for reasons of record, safety or value, or to enable check calibrations or tests to be performed later), the laboratory shall have storage and security arrangements that protect the condition and integrity of the secured items or portions concerned [see also (e)].

_____ (4) The laboratory shall have documented procedures for the receipt, retention or safe disposal of calibration or test items, including all provisions necessary to protect the integrity of the laboratory.

_____ (5) Tamper-resistant seals shall be affixed to operator-accessible controls or adjustments on measurement standards or measuring and test equipment which, if moved, will invalidate the calibration. The laboratory's calibration system shall provide instructions for the use of such seals and for the disposition of equipment with damaged or broken seals.

NOTE: Tamper-resistant seals are sometimes affixed to equipment to prevent unauthorized access to areas where adjustments or critical components are located.

(j) ***Records***

_____ (1) The laboratory shall maintain a record system to suit its particular circumstances and comply with any applicable regulations. It shall retain on record all original observations, calculations and derived data, calibration records and a copy of the calibration certificate, test certificate or test report for an appropriate period. The records for each calibration and test shall contain sufficient information to permit their repetition. The records shall include the identity of personnel involved in sampling, preparation, calibration or testing [see also (c)(2)(iv)].

▸ **EXCEPTION:** The retention of all original observations, calculations, and
▸ derived data in the calibration record system is not a mandatory requirement
▸ for calibration laboratories, although it is encouraged as good laboratory
▸ practice.

_____ (2) All records (including those listed in (f)(4) pertaining to calibration and test equipment), certificates and reports shall be safely stored, held secure and in confidence to the client [see also (b)(2)(ix), (c)(2)(xviii)].

NOTE: The period of retention shall be specified in the quality manual.

Record retention time specified: _____

(k) ***Certificates and reports***

_____ (1) The results of each calibration, test, or series of calibrations or tests carried out by the laboratory shall be reported accurately, clearly, unambiguously and objectively, in accordance with any instructions in the calibration or test methods. The results should normally be reported in a calibration certificate, test report or test certificate and should include all the information necessary for the interpretation of the calibration or test results and all information required by the method used [see also (k)(4)(i)].

NOTE: It is recognized that the results of each calibration do not always result in the production of a calibration certificate or report. Whenever a certificate or report is produced, the above requirements shall be met.

(2) Each certificate or report shall include at least the following information:

_____ (i) a title, e.g., "Calibration Certificate," "Test Report" or "Test Certificate";

_____ (ii) name and address of laboratory, and location where the calibration or test was carried out if different from the address of the laboratory;

_____ (iii) unique identification of the certificate or report (such as serial number) and of each page, and the total number of pages;

_____ (iv) name and address of client, where appropriate;

_____ (v) description and unambiguous identification of the item calibrated or tested [see also (i)(1)];

_____ (vi) characterization and condition of the calibration or test item;

_____ (vii) date of receipt of calibration or test item and date(s) of performance of calibration or test, where appropriate;

EXCEPTION: Although it is encouraged as good laboratory practice, the requirement for inclusion of the date received is not mandatory for calibration laboratories.

_____ (viii) identification of the calibration or test method used, or unambiguous description of any non-standard method used;

_____ (ix) reference to sampling procedure, where relevant [see also (h)(5)];

_____ (x) any deviations from, additions to or exclusions from the calibration or test method, and any other information relevant to a specific calibration or test, such as environmental conditions [see also (c)(2)(xv), (h)(4)];

_____ (xi) measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified;

_____ (xii) a statement of the estimated uncertainty of the calibration or test result, where relevant;

_____ (xiii) a signature and title, or an equivalent identification of the person(s) accepting responsibility for the content of the certificate or report (however produced), and date of issue [see also (c)(2)(vi)];

_____ (xiv) where relevant, a statement to the effect that the results relate only to the items calibrated or tested;

_____ (xv) a statement that the certificate or report shall not be reproduced except in full, without the written approval of the laboratory;

_____ (xvi) a statement that the report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government;

_____ (xvii) the signature of an approved signatory for all test and calibration reports endorsed with the NVLAP logo;

▸ _____ (xviii) special limitations of use; and

▸ _____ (xix) traceability statement.

_____ (3) Where the certificate or report contains results of calibrations or tests performed by subcontractors, these results shall be clearly identified [see also (l)].

_____ (4) Particular care and attention shall be paid to the arrangement of the certificate or report, especially with regard to presentation of the calibration or test data and ease of assimilation by the reader. The format shall be carefully and specifically designed for each type of calibration or test carried out, but the headings shall be standardized as far as possible [see also (k)(1)].

_____ (5) Material amendments to a calibration certificate, test report or test certificate after issue shall be made only in the form of a further document, or data transfer including the statement "Supplement to Calibration Certificate (or Test Report or Test Certificate), serial number ... (or as otherwise identified)," or equivalent form of wording. Such amendments shall meet all the relevant requirements of item (j).

_____ (6) The laboratory shall notify clients promptly, in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any calibration certificate, test report, or test certificate or amendment to a report or certificate.

NOTE: Such notification shall quantify the magnitude of error created in the calibration results. The laboratory shall notify customers promptly, in writing, of any customer's measuring and test equipment found significantly out of tolerance during the calibration/verification process. Measurement data shall be reported so that appropriate action can be taken.

_____ (7) The laboratory shall ensure that, where clients require transmission of calibration or test results by telephone, telex, facsimile or other electronic or electromagnetic means, staff will follow documented procedures that ensure that the NVLAP requirements are met and that confidentiality is preserved.

_____ (8) Whenever a laboratory accredited by NVLAP issues a calibration or test report which contains data covered by the accreditation and also data not covered by the accreditation, it must clearly identify in its records, and in the report to the client, specifically which calibration or test method(s), or portion of a calibration or test method(s), was not covered by the accreditation. The laboratory must also inform the client, before the fact, when calibrations or tests requested are not covered by the accreditation.

NVLAP policy regarding calibration and test reports issued by an accredited laboratory, which reference the laboratory's accredited status, requires that any calibration or test report containing data from calibrations or tests which are not covered by the accreditation include:

_____ (i) a statement at the beginning of the report prominently indicating, "This report contains data which are not covered by the NVLAP accreditation"; and

_____ (ii) a clear indication of which data are not covered by the accreditation.

The laboratory must not misrepresent its accreditation. When a client requires or requests accredited services and any of the requested services are not covered by the accreditation, the client must be so advised.

(l) ***Subcontracting of calibration or testing*** [see also (k)(3)]

_____ (1) Where a laboratory subcontracts any part of the calibration or testing, this work shall be placed with a laboratory complying with these requirements. The laboratory shall ensure and be able to demonstrate that its subcontractor is competent to perform the activities in question and complies with the same criteria of competence as the laboratory in respect of the work being subcontracted. The laboratory shall advise the client in writing of its intention to subcontract any portion of the testing to another party.

_____ (2) The laboratory shall record and retain details of its investigation of the competence and compliance of its subcontractors and maintain a register of all subcontracting.

_____ (3) A NVLAP-accredited laboratory intending to subcontract testing or calibration work that will be performed and reported as meeting NVLAP procedures and criteria must:

_____ (i) have in its quality manual a subcontracting policy compatible with the NVLAP policy, with a description of the procedures for administering and implementing those actions to demonstrate the conformance and consistency of the subcontracted laboratory to perform according to NVLAP procedures;

_____ (ii) place the subcontracted work with a laboratory that maintains accreditation established by NVLAP shown by a current NVLAP Lab Code, or provide and maintain current records that demonstrate that the subcontracted laboratory is competent to perform the test(s) or calibration(s) and that it operates in a manner consistent with and in conformance to NVLAP criteria for accreditation;

_____ (iii) clearly identify in its records, and in the report to the client, exactly which data were obtained by the NVLAP-accredited laboratory and which data were obtained by the subcontractor, NVLAP-accredited or not;

_____ (iv) inform its client, before the fact, that it intends to subcontract for completion of all or a portion of the client's work; and

_____ (v) include at the beginning of the report the name, address, and contact person of the subcontracted laboratory(ies), and one of the following statements, as appropriate:

if NVLAP-accredited

"This report contains data which were produced by a subcontracted laboratory **ACCREDITED (NVLAP LAB CODE)** for the calibration or test methods performed"

if not NVLAP-accredited

"This report contains data which were produced by a subcontracted laboratory **NOT ACCREDITED** for the calibration or test methods performed."

The requirements of this section do not supersede any regulation, law, contract specification, or other related conditions which require NVLAP accreditation.

(m) ***Outside support services and supplies***

_____ (1) Where the laboratory procures outside services and supplies in support of calibrations or tests, the laboratory shall use only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's calibrations or tests.

_____ (2) Where no independent assurance of the quality of outside support services or supplies is available, the laboratory shall have procedures to ensure that purchased equipment, materials and services comply with specified requirements. The laboratory should, wherever possible, ensure that purchased equipment and consumable materials are not used until they have been inspected, calibrated or otherwise verified as complying with any standard specifications relevant to the calibrations or tests concerned [see also (h)(8)].

_____ (3) The laboratory shall maintain records of all suppliers from whom it obtains support services or supplies required for calibrations or tests.

(n) ***Complaints*** [see also (c)(2)(xvii)]

_____ (1) The laboratory shall have documented policy and procedures for the resolution of complaints received from clients or other parties about the laboratory's activities. A record shall be maintained of all complaints and of the actions taken by the laboratory.

_____ (2) Where a complaint, or any other circumstance, raises doubt concerning the laboratory's compliance with the laboratory's policies or procedures, or with the NVLAP requirements or otherwise concerning the quality of the laboratory's calibrations or tests, the laboratory shall ensure that those areas of activity and responsibility involved are promptly audited in accordance with item (c)(3).

(o) ***Measuring and test equipment (M & TE)***

NOTE: This section applies to the control of measuring and test equipment (M & TE) used to assure that supplies and services comply with prescribed customer requirements. It is based in large part on the requirements found in government audit standards such as MIL-STD 45662A, and is found in Part II of the ANSI/NCSL Z540-1-1994 (Draft) standard.

(1) General requirements for M & TE

_____ (i) The supplier shall establish and document a system to control the calibration/verification of M & TE.

_____ (ii) M & TE used to determine compliance with customer technical specifications shall be calibrated or verified in accordance with sections 285.33(b) through (n).

_____ (iii) The supplier shall have a program to recall for calibration or verification, or remove from service, M & TE that has exceeded its calibration interval, has broken calibration seals, or is suspected to be malfunctioning because of mishandling, misuse, or unusual results.

_____ (iv) All operations performed by the supplier in compliance with these requirements shall be subject to customer verification at unscheduled intervals.

_____ (v) The supplier shall carry out, or arrange to have carried out, periodic quality auditing of the calibration and verification system in order to ensure its continuing effective implementation and compliance with these requirements.

- Based on the results of the audits and any other relevant factors, such as customer feedback, the supplier shall review and modify the system as necessary.

- Plans and procedures for the audits shall be documented. The conduct of the audit and any subsequent corrective action shall also be documented.

(2) Detailed requirements for M & TE

_____ (i) Calibration system description: The supplier shall provide and maintain a written description of the calibration/verification system covering M & TE and measurement standards. The description shall be sufficient to satisfy each requirement of section 285.33(o) and any deviations shall be submitted with supporting documentation to the customer for approval.

_____ (ii) Adequacy of measurement standards: Measurement standards used by the supplier for calibrating M & TE and other measurement standards shall comply with the requirements of items (f)(1), (g)(1), and (h)(2).

_____ (iii) Environmental conditions: M & TE shall be used in an environment controlled to the extent necessary to ensure valid results. Due consideration shall be given to temperature, humidity, lighting, vibration, dust control, cleanliness, electromagnetic interference and any other factors affecting the results of measurements. Where pertinent, these factors shall be monitored and recorded and, when appropriate, correcting compensations shall be applied to measurement results.

_____ (iv) Intervals of calibration and verification: M & TE requiring calibration shall be calibrated or verified at periodic intervals established and maintained to assure acceptable reliability, where reliability is defined as the probability that M & TE will remain in-tolerance throughout the interval. Intervals shall be established for all M & TE requiring calibration unless the equipment is regularly monitored through the use of check standards in a documented measurement assurance process. Check standards must closely represent the item parameters normally tested in the process and the check standard must be verified periodically. Where intervals are used to ensure reliability, the interval setting system must be systematically applied and shall have stated reliability goals and a method of verifying that the goals are being attained. Intervals may be based on usage or time since last calibration or verification. All exemptions from periodic calibration or verification shall be documented. The recall system may provide for the temporary extension of the calibration due date for limited periods of time under specified conditions that do not unreasonably impair the satisfaction of the customer's requirements.

_____ (v) Calibration procedures: Procedures used to calibrate/verify the supplier's M & TE shall comply with the requirements of items (h)(1) and (h)(2).

_____ (vi) Out-of-tolerance conditions: If any M & TE is found to be significantly out of tolerance during the calibration/verification process, the supplier's system shall provide for notification to the user and to the supplier's quality element, if appropriate, of the out-of-tolerance condition with the associated measurement data so that appropriate action can be taken.

_____ (vii) Adequacy of calibration system: The supplier shall establish and maintain documented procedures to evaluate the adequacy of the calibration system and to ensure compliance with these requirements.

_____ (viii) Calibration sources: M & TE requiring calibration shall be calibrated or verified by laboratories that comply with sections 285.33(b) through (n).

_____ (ix) Records: These requirements shall be supported by records documenting that established schedules and procedures are followed to maintain the adequacy of all M & TE. The records for M & TE requiring calibration shall include an individual record of calibration or verification, or other means of control, providing a description or identification of the item, calibration interval, date calibrated, identification of the calibration source, calibration results (data and/or condition status) and calibration action taken (adjusted, repaired, new value assigned, derated, etc.).

_____ (x) Calibration status: M & TE shall be labeled to indicate calibration or verification status. The label shall identify specific date calibrated (day, month, year, Julian date, or equivalent) and the specific calibration due date or usage equivalent. Items not calibrated to their full capability or which have other limitations of use, shall be labeled or otherwise identified as to the limitations. When it is impractical to apply a label directly to an item, the label may be affixed to the instrument container or some other suitable means may be used to reflect calibration status. Tamper-resistant seals are affixed to operator accessible controls or adjustments which if moved will invalidate the calibration. The quality system shall provide instructions for the disposition of equipment with broken tamper-resistant seals.

_____ (xi) Control of subcontractor calibration: The supplier is responsible for assuring that the subcontractor's calibration system conforms to section 285.33 (l) to the degree necessary to assure compliance with contractual requirements. NVLAP accreditation of the subcontractor's laboratory can serve as the basis for compliance with this requirement.

_____ (xii) Storage and handling: M & TE shall be handled, stored, and transported in a manner which shall not adversely affect the calibration or condition of the equipment.

NVLAP LAB CODE:

GENERAL OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

GENERAL OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

APPENDIX C

SPECIFIC OPERATIONS CHECKLIST

NVLAP LAB CODE: _____

SPECIFIC OPERATIONS CHECKLIST

THERMAL INSULATION MATERIALS

Instructions to the Assessor: The checklist addresses specific accreditation criteria prescribed in Section 285.33, *Criteria for Accreditation*, of the Thermal Insulation Materials (TIM) Program Handbook. Included also are instructions and comments sheets used for observing actual demonstrations of the performance of selected test methods. These criteria **do not** supersede the *Criteria for Accreditation*, based on Section 285.33 of the *NVLAP Procedures and General Requirements* (NIST Handbook 150), which are addressed in the GENERAL OPERATIONS CHECKLIST.

Place an "X" beside any of the following items which represent a deficiency. Place a "C" beside each item on which you are commenting for other reasons. Record the item number and your deficiency explanation and/or comments on the appropriate comment sheet(s). Place a check beside all other items you observed or verified at the laboratory.

1 QUALITY SYSTEM

_____ 1.1 The quality manual (or supporting documentation) provides detailed procedures (including descriptions of equipment) that the laboratory follows in conducting thermal, physical, mechanical, and chemical measurements using the different thermal insulation test methods for which it seeks accreditation.

_____ 1.2 The quality manual (or supporting documentation) lists the range (e.g., size, shape, density, and property level) of test specimens that a laboratory can test for each test method.

_____ 1.3 The quality manual describes practices for maintenance and calibration of the equipment used in conducting the tests on thermal insulation materials.

2 PERSONNEL

Personnel competency for Thermal Insulation Materials testing includes applicable portions of the following, as a minimum:

_____ 2.1 general requirements of the test methods;

_____ 2.2 specimen preparation, dimensional measurements, mounting techniques;

_____ 2.3 operation of environmental control apparatus, including humidity cabinets;

_____ 2.4 procedures for environmental conditioning of specimens;

_____ 2.5 determination of moisture content, specific gravity, or density;

_____ 2.6 operation of drying ovens and furnaces;

_____ 2.7 description of specimen and test setup;

_____ 2.8 operation of balances and scales for mass determination;

_____ 2.9 use of dimensional measuring devices (calipers, micrometers, etc.);

_____ 2.10 verification of performance of apparatus and equipment (e.g., using secondary standards);

_____ 2.11 calibration of test machines;

_____ 2.12 calibration of load/deformation/strain-recording equipment;

_____ 2.13 operation of fire performance test equipment;

_____ 2.14 thermocouple mounting and related instrumentation;

_____ 2.15 operation of heat flux meters and pyrometers;

_____ 2.16 use of automatic data logging and readout instrumentation;

_____ 2.17 operation of ammeters, ohmmeters, voltmeters, wattmeters, potentiometers;

_____ 2.18 operation of radiant panel;

_____ 2.19 operation of heat flow meters;

_____ 2.20 operation of guarded hot plates;

_____ 2.21 calculation of thermal parameters (transmittance, conductance, conductivity, resistance, etc.), if applicable.

3 CALIBRATION AND TEST METHODS

3.1 Laboratory Operations and Test Standards

_____ 3.1.1 Samples and test specimens are uniquely identified for correlation with related records.

_____ 3.1.2 Test data forms (as required by the reference standard or developed in-house) are properly completed.

_____ 3.1.3 The laboratory maintains a dated log book or record for the tests it performs.

_____ 3.1.4 Measurement equipment is appropriate for the test method.

_____ 3.1.5 The latest version of the test standards for which the laboratory seeks accreditation is available.

3.2 Calibration Requirements

Test equipment, devices, and instruments meet the requirements of the appropriate standards and are properly calibrated (and meet calibration conditions). Specific calibration requirements for the TIM program are:

- in accordance with the manufacturer's recommendation;
- the test method; or
- as specified in the following table;

whichever results in shorter time periods between calibrations.

Apparatus/Instrumentation	*Calibration or Verification Frequency*
dimensional measuring devices (calipers, micrometers, etc.)	annually
drying ovens	annually
furnaces	annually
tensile/compression test machines and load cells	annually
scales and balances	annually
heat flux meters	annually
pyrometers	annually
automatic data logging and readout*	annually
ammeters, ohmmeters, voltmeters, wattmeters*	annually
potentiometers*	annually
thermocouple and related instrumentation*	annually
thermostats*	annually
environmental conditioning units	quarterly
humidity cabinets	quarterly
radiant panel	per test method
heat flow meters**	per test method
guarded hot plates	per test method

* If the calibration of the equipment is shown to vary due to the lack of modern solid-state electronics, then the entry under *Frequency* shall be 6 months.

** If certification of measurement is required using ASTM C518 (NVLAP Test Method Code 01/T06), the calibration procedures and frequencies given in Section 5.4.1 of that test method must be followed.

3.3 Thermal, Mechanical, Physical, Flammability and Chemical Properties

_____ 3.3.1 Samples are properly prepared, environmentally conditioned (including proper moisture content), handled, and maintained before testing.

_____ 3.3.2 Measurements of specimen dimensions and mass are determined correctly; descriptions of important sample characteristics are recorded when required.

_____ 3.3.3 Test(s) are conducted within the specified temperature, humidity, and/or air flow conditions.

_____ 3.3.4 Where thermal measurements are critical, procedures for adequate calibration checks and verification of equipment performance need to be documented to ensure that accurate and repeatable thermal measurements are obtained, which are traceable to national standards.

_____ 3.3.5 Where criteria on the accuracy of the average power are required (e.g., ASTM C976, Par. 5.8.1.4; ASTM C236, Par. 6.6.2), the laboratory has sufficient documentation to demonstrate that the criteria are met.

_____ 3.3.6 Where criteria on the accuracy of thermocouples or other temperature sensors are required (e.g., ASTM C976, Par. 5.7.2.3; ASTM C236, Par. 6.6.1), the laboratory has sufficient documentation to demonstrate that the criteria are met.

_____ 3.3.7 Where error analyses are required (e.g., ASTM C518, Sec. 9), the laboratory has written procedures and documentation which demonstrate that the error analysis requirements are met.

_____ 3.3.8 Documentation must be available to ensure that temperature measurements are traceable to national standards.

_____ 3.3.9 Thermal insulation specimens and products are tested in the specified orientation, if any, and with proper test setup.

_____ 3.3.10 For mechanical testing, the proper rate of load, strain, or deformation is applied to the specimen.

NVLAP LAB CODE:

TIM SPECIFIC OPERATIONS CHECKLIST - COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number from the checklist. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item No.	*Comments and/or Deficiencies*

APPENDIX D

TEST METHOD SELECTION LIST

NVLAP LAB CODE: _____

THERMAL INSULATION MATERIALS
TEST METHOD SELECTION LIST

Check those test methods for which you are requesting accreditation and total the test methods at the bottom of each page. The latest version of the test methods must be used (see NVLAP Procedures Sec. 285.32(a)(5)).

An asterisk (*) beside the NVLAP Test Method Code indicates that proficiency testing is required. If you request accreditation for one or more of these test methods, you will be notified of the required proficiency testing.

	NVLAP Test Method Code	*Test Method Designation*	*Short Title*
CORROSIVENESS			
___	01/C01	ASTM C739 (Sec. 9)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Corrosiveness)
___	01/C02	16 CFR-Part 1209.5	Cellulose Insulation Test Procedures for Corrosiveness (Loose-Fill)
MASS, DENSITY, AND DIMENSIONAL STABILITY			
___	01/D01	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
___	01/D02	ASTM C167	Thickness and Density of Blanket or Batt Thermal Insulations
___	01/D03	ASTM C209 (Sec. 6)	Cellulosic Fiber Insulating Board (Thickness)
___	01/D04	ASTM C209 (Sec. 13)	Cellulosic Fiber Insulating Board (Water Absorption, 2 hour)
___	01/D05	ASTM C209 (Sec. 13)	Cellulosic Fiber Insulating Board (Water Absorption, 24 hour)
		by D1037 (Sec. 100-106)	Wood-Base Fiber and Particle Panel Materials (Water Absorption and Thickness Swelling, 24 hour)

___	01/D06	ASTM C209 (Sec. 14)	Cellulosic Fiber Insulating Board (Linear Expansion)
		by D1037 (Sec. 107-110)	Wood-Base Fiber and Particle Panel Materials (Linear Variation with Change in Moisture Content)
___	01/D07	ASTM C272	Water Absorption of Core Materials for Structural Sandwich Constructions
___	01/D08	ASTM C302	Density of Preformed Pipe-Covering-Type Thermal Insulation
___	01/D09	ASTM C303	Density of Preformed Block-Type Thermal Insulation
___	01/D11	ASTM C356	Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat
___	01/D12	ASTM C411	Hot-Surface Performance of High Temperature Thermal Insulation
___	01/D13	ASTM C519	Density of Fibrous Loose-Fill Building Insulations
___	01/D14	ASTM C520	Density of Granular Loose-Fill Insulations
___	01/D15	ASTM D756 (Proc. A)	Weight and Shape Changes of Plastics under Accelerated Service Conditions
___	01/D16	ASTM D756 (Proc. B)	Weight and Shape Changes of Plastics under Accelerated Service Conditions
___	01/D17	ASTM D756 (Proc. E)	Weight and Shape Changes of Plastics under Accelerated Service Conditions
___	01/D18	ASTM D1622	Apparent Density of Rigid Cellular Plastics
___	01/D19	ASTM D2126	Response of Rigid Cellular Plastics to Thermal and Humid Aging
___	01/D23	ASTM D2842	Water Absorption of Rigid Cellular Plastics
___	01/D24	ASTM C739 (Sec. 12)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Moisture Vapor Absorption)

___	01/D26*	16 CFR-Part 1209.4	Settled Density (Specimen Container Cellulosic Fiber Loose-Fill)
___	01/D27	ASTM C739 (Sec. 8)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Density)
___	01/D30	ASTM C585	Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)
___	01/D31	MIL-I-22344D (Para. 4.6.3, 4.6.4)	Insulation, Pipe, Thermal, Fibrous Glass: Alkalinity and Hydrogen-ion Concentration (pH)

FLAMMABILITY

___	01/F01	TAPPI T461	Flame Resistance Treated Paper and Paperboard
___	01/F02*	ASTM E84	Surface Burning Characteristics of Building Materials
___	01/F05	ASTM E136	Behavior of Materials in a Vertical Tube Furnace at 750 °C
___	01/F07*	16 CFR-Part 1209.6	Critical Radiant Flux (Radiant Panel, Cellulosic Fiber)
___	01/F08*	16 CFR-Part 1209.7	Smoldering Combustion (Smolder Box, Cellulosic Fiber)
___	01/F09	ASTM C739 (Sec. 10)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Critical Radiant Flux)
___	01/F10	ASTM C739 (Sec. 14)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Smoldering Combustion)

STRENGTH

___	01/S01	ASTM C165[1]	Compressive Properties of Thermal Insulations
	___	(Proc. A)	
	___	(Proc. B)	

[1] Pay only one test method fee, regardless of whether Proc. A or Proc. B or both are selected.

___	01/S02	ASTM C203	Breaking Load and Flexural Properties of Block-Type Thermal Insulation
___	01/S03	ASTM C209 (Para. 9)	Cellulosic Fiber Insulating Board (Transverse Strength)
___	01/S04	ASTM C209 (Para. 10)	Cellulosic Fiber Insulating Board (Deflection at Specific Minimum Load)
___	01/S05	ASTM C209 (Para. 11)	Cellulosic Fiber Insulating Board (Tensile Strength Parallel to Surface)
___	01/S06	ASTM C209 (Para. 12)	Cellulosic Fiber Insulating Board (Tensile Strength Perpendicular to Surface)
___	01/S07	ASTM C273	Shear Properties in Flatwise Plane of Flat Sandwich Constructions or Sandwich Cores
___	01/S08	ASTM C446	Breaking Load and Calculated Modulus of Rupture of Preformed Insulation for Pipes
___	01/S10	ASTM D828	Tensile Properties of Paper and Paperboard Using Constant-Rate-of-Elongation Apparatus
___	01/S11	ASTM D1621 (Proc. A)	Compressive Properties of Rigid Cellular Plastics (Crosshead Motion)
___	01/S15	ASTM C421	Tumbling Friability of Preformed Block-Type Thermal Insulation
___	01/S16	ASTM C1101/C1101M	Classifying the Flexibility or Rigidity of Mineral Fiber Blanket and Board Insulation

THERMAL RESISTANCE

___	01/T01*	ASTM C177	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
___	01/T04*	ASTM C236	Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box

___	01/T05	ASTM C335	Steady-State Heat Transfer Properties of Horizontal Pipe Insulation
___	01/T06*	ASTM C518	Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
___	01/T09	ASTM C653	Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation
___	01/T10	ASTM C687	Thermal Resistance of Loose-Fill Building Insulation
___	01/T11*	ASTM C976	Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box
___	01/T12	ISO 8302	Thermal Insulation - Determination of Steady-State Thermal Resistance and Related Properties - Guarded Hot Plate Apparatus

RELATED MATERIAL PROPERTIES

___	01/V02	TAPPI T419	Starch in Paper
___	01/V03	TAPPI T487	Fungus Resistance of Paper and Paperboard
___	01/V04	ASTM E96	Water Vapor Transmission of Materials
___	01/V05	ASTM C739 (Sec. 11)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Fungi Resistance)
___	01/V06	ASTM C739 (Sec. 15)	Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation (Starch)
___	01/V07	ASTM C1104/C1104M	Water Vapor Sorption of Unfaced Mineral Fiber Insulation

CANADIAN STANDARDS (SPECIFICATIONS)

___	01/W01	CAN/CGSB-51.2-M88	Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers
___	01/W02	CAN/CGSB-51.9-92	Mineral Fibre Thermal Insulation for Piping and Round Ducting

___	01/W03	CAN/CGSB-51.10-92	Mineral Fibre Board Thermal Insulation
___	01/W04	CAN/CGSB-51.11-92	Mineral Fibre Thermal Insulation Blanket

___ Subtotal of test methods selected from this page

___ Total number of test methods selected for Thermal Insulation Materials
(Enter total on Line 5b of the Fee Calculation Worksheet.)

APPENDIX E

CRITICAL ELEMENTS

CRITICAL ELEMENTS

DESCRIPTION: "Critical elements" are summary statements of key provisions from standard test methods. These summaries are provided to the Technical Experts for use during on-site assessments, as part of their operation manual. This appendix shows the format of a critical element summary, but the critical elements for the TIM Program are not included in this handbook.

PURPOSE: Critical elements assist the assessors in uniformly and objectively conducting their evaluations. The critical elements provide guidance for a common basis to be applied by individual assessors in conducting on-site evaluations. They are *not* intended to be replacements for the written test procedures issued by standards-development organizations.

FORMAT OUTLINE: Typically, the critical element summary includes the headings listed below. The explanatory comments given below indicate the type of information summarized under each heading.

PROGRAM TITLE: The title of the specific NVLAP program; in the present case, the TIM Program.

NVLAP TEST METHOD CODE: The code for each test method given on the Test Method Selection List for the specific NVLAP program.

TEST METHOD DESIGNATION: An alphanumeric designation assigned to the test method by the organization that issued the standard; for example, designations include ASTM and TAPPI in the case of the TIM Program.

SHORT TITLE: The title of the test method as given on the NVLAP Test Method Selection List.

ENVIRONMENTAL/SAMPLE AND CONDITIONING REQUIREMENTS: A summary of conditioning or other treatment to which the test specimen is subjected before the test is conducted.

TEST EQUIPMENT AND APPARATUS: A listing of the major equipment and apparatus that the laboratory needs to have available to conduct the test.

CALIBRATION(S): A summary of the calibration requirements delineated in the test method.

TESTING PROCEDURES: A summary of the main steps of the test method.

STANDARD TEST REPORT REQUIREMENTS: A listing of the items that the method requires the test operator to include in the test report.

SPECIAL CONSIDERATIONS: A listing of those aspects of the test method to which the NVLAP technical assessor must pay special attention during the on-site assessment.

APPENDIX F

ON-SITE ASSESSMENT - TEST METHOD REVIEW

NVLAP LAB CODE:

NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM

ON-SITE ASSESSMENT - TEST METHOD REVIEW

Instructions to the Assessor:

During the on-site visit you will be required to assess the laboratory's ability to conduct the specific test methods for which it has applied for accreditation. In some cases this will involve many test methods. You may not have sufficient time to perform an in-depth assessment of each method.

Use the attached sheets to indicate which test methods you assessed at the laboratory, and the extent of your assessment. Indicate whether you performed an in-depth review, including a full review of laboratory activities. These include sample control and preparation, procedure review, observation of actual testing, environmental control check, equipment review, calibration checks, record-keeping practices and report forms; or, that you observed selected items to determine that the laboratory demonstrated the ability to conduct the test.

The specific requirements for each test method are detailed in the CRITICAL ELEMENTS, the HANDBOOK, and/or the TEST METHOD. Any items required under "special considerations" will be described either in the CRITICAL ELEMENTS, special instructions below, or in other correspondence.

Fill out the ON-SITE ASSESSMENT - TEST METHOD REVIEW SUMMARY by writing in the test method designation. Indicate on the summary the DEPTH of the assessment for each test method you reviewed, using one of the symbols shown below:

OT - (Observed Test)
EA - (Examined Apparatus)
W/TT - (Walked/Talked Through)
LDP - (Listened to Description of Procedures)

All ***deficiencies*** must be accompanied by a comment.

Use the ON-SITE ASSESSMENT - TEST METHOD REVIEW COMMENTS AND DEFICIENCIES sheets to write comments on what you observed. Preface each comment with the test method designation to which the comment applies. Please be liberal with your comments so that we have a good written record of your observations; the more information we have, the better the accreditation decision we can make.

Special Instruction:

NVLAP LAB CODE:

National Voluntary Laboratory Accreditation Program (NVLAP)

ON-SITE ASSESSMENT - TEST METHOD REVIEW SUMMARY

Test Method (number, name or designation)	Depth of Assessment	Environmental/ Test Sample Conditioning	Test Equipment and Apparatus	Calibration	Test Procedures	Test Reports	Special Considerations

NVLAP LAB CODE:

ON-SITE ASSESSMENT - TEST METHOD REVIEW COMMENTS AND DEFICIENCIES

Instructions to the Assessor: Use this sheet to document comments and deficiencies. For each, identify the appropriate item number. Identify comments with a "C" and deficiencies with an "X." If additional space is needed, make copies of this page (or use additional blank sheets).

Item Number	*Comments and/or Deficiencies as Noted on the On-Site Assessment - Test Method Review Summary*

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Periodical

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